## AN APPEAL FOR STABILIZATION OF CERTAIN NAMES IN THE PROTOZOAN FAMILY TETRAHYMENIDAE (SUBPHYLUM CILIOPHORA, ORDER HYMENOSTOMATIDA), WITH SPECIAL REFERENCE TO THE GENERIC NAME *TETRAHYMENA* FURGASON, 1940. Z.N.(S.) 625

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### I. Introduction:

1. In the past 25-30 years the scientific community has seen an unprecedented growth in research on the physiology (especially biochemistry) of ciliate Protozoa (see the series of volumes by Lwoff, 1951, Hutner and Lwoff, 1955, Hutner, 1964; and also references in Corliss, 1954a, 1965). The most profoundly studied ciliates have been several strains of the species for which the best name, in our opinion, is Tetrahymena pyriformis (Ehrenberg, 1830 (:96)), Lwoff, 1947 (:103) (syn. Leucophrys pyriformis Ehrenberg, 1830). According to recent counts (Corliss, 1954a, 1957, 1965), investigations on the biology of this and a few congeneric species have yielded approximately 1500 published works, of which a majority have been physiologically, as opposed to morphologically, oriented-definitive studies in the latter category having, moreover, been carried out largely in the last decade. The consequence of the historical lag in morphological behind physiological research on T. pyriformis and its congeners is that their literature up to the last decade was in a state of taxonomic and nomenclatural chaos, with T. pyriformis itself masquerading, in the last 30 to 40 years alone, under at least thirteen names (see Corliss, 1952a, 1953a).

2. It was, in fact, the eruption of work of a physiological nature that made imperative the study of the morphology, taxonomy, and nomenclature of members of the *Tetrahymena-group*,<sup>2</sup> or family Tetrahymenidae Corliss, 1952 (1952d : 4). The reason for the recency of definitive morphological studies on these (and many other) free-living ciliates—organisms long known with an extensive 19th and 20th century literature—is simply given: techniques adequate to reveal the detailed structure have come into general use only in relatively recent years (see Corliss, 1963). Most of the early descriptions (of the 18th and 19th centuries) were very crude, often insufficient to permit the certain recognition of species—and not infrequently of genera. Comparable difficulties even obtain with certain descriptions of the past few decades. The literature is therefore replete with doubtful names, and nomenclatural problems will doubtless plague the taxonomy of ciliates for some years to come.

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<sup>&</sup>lt;sup>2</sup> One of us (J.O.C.) designated this assemblage of ciliates as the "Colpidium-Glaucoma-Leucophrys-Tetrahymena", or "C-G-L-T", group in a series of papers (see Corliss, 1950, 1951a, b, 1952a, 1953a), but this is shortened to "Tetrahymena-group" in the present paper.

3. For over fifteen years, we, the authors, have exchanged views on the nomenclature of the Tetrahymena-group. The status of the generic name Tetrahymena Furgason, 1940 (: 258), has been of particular concern. Some years ago a thorough-going study of the literature revealed the fact to one of us (Corliss, 1953a : 66) that, contrary to an earlier conclusion (Corliss, 1952a, b). this generic name cannot be used for the species T. pyriformis and its congeners under the usual application of the International Code of Zoological Nomenclature. Evaluation of a number of earlier nominal genera yielded evidence that several names antcdate Tetrahymena as possible, or definite, subjective synonyms thereof. Sharing an interest in preserving the widely used generic name Tetrahymena, we decided (Corliss and Dougherty, 1955) to make a joint appeal to the International Commission on Zoological Nomenclature in order to secure this; and, in making a comprehensive nomenclatural survey. we soon found that a conscientious attempt to resolve the problems connected with Tetrahymena led us into a veritable labyrinth of taxonomic and nomenclatural difficulties, especially those inherent in the evaluation of a substantial body of early literature extending back into the latter half of the 18th century. Although in the present paper our fundamental concern is with questions of nomenclature, we cannot avoid taking up taxonomic problems as well, some of which are sub iudice at our present state of knowledge.

4. In finally formulating the present appeal to the International Commission, we hope not only to obtain, ultimately, a ruling resolving crucial problems in the nomenclature of the *Tetrahymena*-group, but also to stimulate other workers in ciliate taxonomy to submit to the International Commission proposals for the appropriate solution of similar nomenclatural problems—namely, those arising wherever changes required under strict application of the Code threaten to upset long-established and/or widely used generic or specific names.

5. Our several years of dealing both with the voluminous older literature, essential to a nomenclatural analysis of the *Tetrahymena*-group, and with the ever-growing modern literature devoted to these organisms, in all phases of their biology, have served to reinforce our major conviction with respect to the nomenclature of the group, and we can accordingly reaffirm the contention of one of us (Corliss, 1953a) that stability and uniformity of nomenclatural usage are best served if the generic name *Tetrahymena* is preserved through the invocation, by the International Commission, of its plenary powers to accomplish this.<sup>3</sup>

6. Thus, in order to secure the preservation of *Tetrahymena* Furgason, 1940, as a valid generic name with type-species *T. geleii* Furgason, 1940 (subjective junior synonym of *Leucophrys pyriformis* Ehrenberg, 1830), it is necessary to suppress the application of a number of earlier names actually or potentially available for a taxonomic genus to include *T. geleii*. (In the discussion that

<sup>&</sup>lt;sup>3</sup> It may seem strange to workers in some fields that we are hereby appealing for the retention of a name only 27 years old (at the time of submitting this application). Such is eloquent testimony of the fact that a tremendous growth in the literature on these organisms has taken place in but two decades and that, also, knowledge of their nomenclature, which is a reflection of knowledge of their taxonomy, has, until recently, lagged behind the mush-rooming studies of their physiology.

follows we refer to this species as T. pyriformis, since that is the name by which, in our opinion, it should be known.) The problem is made especially complex by the fact that certain of the nominal genera involved do not have the same type-species as *Tetrahymena* and that for various reasons some workers have expressed disagreement with the view that all these species are congeneric with T. pyriformis. The history of T. pyriformis provides an excellent example of the problems that can arise in the determination of nomenclaturally correct names for ciliates. Fortunately, the chaos of 25 years ago (and earlier), when this organism was appearing in print under a variety of names, has been largely resolved and the name T. pyriformis (or much less often now, T. geleii) has been generally adopted. However, we have found, on careful study, that at least two specific names antedating pyriformis Ehrenberg, 1830 (: 96) constitute possible subjective senior synonyms of Ehrenberg's specific name. (See, especially, paragraphs 37 and 38). Again, invocation by the International Commission of its plenary powers in this instance to secure pyriformis would. we feel, he the best solution.

7. A third important nomenclatural problem in the *Tetrahymena-g*roup concerns the specific name *patula* as used by Ehrenberg (1830:96—in the combination *Leucophrys patula*). It applies to a species congeneric, in our view, with *T. pyriformis*. In this instance, the name *patula* did not originate with Ehrenberg, but with O. F. Müller (1786:181), who applied it to a composite species. Details are given in paragraphs 40–45. We again feel that Ehrenberg's usage, which is that universally followed today, should be preserved by the International Commission acting under its plenary powers.

8. Thus we seek from the International Commission, acting under its plenary powers, ruling that will secure three important names—*Tetrahymena* Furgason, 1940, at the generic level, and *pryiformis* Ehrenberg, 1830, and *patula*, sensu Ehrenberg, 1830, at the specific level—all as they are generally used today. Logically arising, as well, are certain related actions that the International Commission should, or could, take—suppression of certain names under plenary powers and additions to the appropriate Official Lists and Official Indexes. We believe that all these problems can be satisfactorily resolved by the promulgation of an Opinion by the International Commission

9. The balance of this paper is therefore divided into three sections: (1) dealing with actions needed to validate the generic name *Tetrahymena* and the specific names *pyriformis* and *patula*; (2) reviewing family-group names involved; and, finally, (3) summarizing our recommendations for the solution of the problems raised. All references to the "international rules" are to the International Code of Zoological Nomenclature (1961).

## II. Actions Needed to Validate the Generic Name Tetrahymena Furgason, 1940, and the Specific Names pyriformis Ehrenberg, 1830, and patula sensu Ehrenberg, 1830

10. Species identical, or, in our opinion, definitely or probably congeneric, with *T. pyriformis* have been referred to some twenty nominal genera, which fall into three categories: very early genera without hitherto validly established types; more recent genera with types not congeneric with *T. pyriformis* (by the

consensus of current opinion); and more recent genera with types subjectively identical, or congeneric, with T, pyriformis (plus Tetrahymena itself). At this point the twenty genera in question are appropriately listed, arranged according to the foregoing three categories and chronologically within each category (more complete citations—i.e., including pagination and information on type determination—are to be found in Table 1).

(a) Genera without validly established types

- (i) Enchelys (emendation—by Berthold in Latreille, 1827—of Enchelis) Müller, 1773;
- (ii) Trichoda Müller, 1773;
- (iii) Leucophra Müller, 1780—with its typographical variants (errors)<sup>4</sup> Leucopera Gmelin, 1790, Leucophora Goldfuss, 1820, and Leucophrus Ehrenberg, 1838;
- (iv) Leucophrys Ehrenberg, 1830 (deliberate emendation, hence objective synonym, of Leucophra);

(v) Acomia Dujardin, 1841.

- (b) Genera with established types not considered congeneric with T. pyriformis (vi) Colpoda (emendation—by Gmelin, 1790—of Kolpoda) Müller, 1773 (type Kolpoda cucullus Müller, 1773);
  - (vii) Glaucoma Ehrenberg, 1830 (type G. scintillans Ehrenberg, 1830);
  - (viii)Balantidium Claparède and Lachmann, 1858 (type Bursaria entozoon Ehrenberg, 1838);
  - (ix) Colpidium Stein, 1860 (= 1860a) (type Paramaecium kolpoda Losana,<sup>5</sup> 1829 [emended to Paramecium Colpoda, by Ehrenberg, 1838]).

<sup>4</sup> Grnelin (1790: 3028) appears to have been the first to use the spelling "Leucoptra", obviously through typographical error since the correct spelling "Leucoptra" is to be found in a later section of the same work (: 3902). Ehrenberg (1838: 31) is apparently responsible for first claiming "Leucoptra" Cuvier (1817) as a variant of Leucoptra, Agassiz (1843: 7) followed Ehrenberg in this and, in addition, attributed the spelling "Leucoptra" to "Nemnich" (i.e. Nemnich and Gebauer, 1794 (;rpesumably) column 388). Both works were incorrect, ouver (1817: 92) used the vernacular word "Leucoptres" in the same of "the leucoptra". A careful check of all sections of the dictionary by Nemnich and Böhme, 1796 (1796-98), a (1796-98) (a, 1796-98) (b, 1798), has failed to reveal the spelling "Leucoptra" either in the part ("Bd, III") to which Agassiz attributed it, or in later sections. Nemnich and Böhme, 1796 (1796-98), a (1796-98) (b, 1798), has "Leucoptra" is to be found "Leucoptra" (1794: column 388) as "Leucoptra" because, following it, is to be found "Leucoptra" attributed to Ehrenberg in straber of algasbeit order. Agassiz's cataloging (1843) of certain protozon genera).

Agassiz's cataloging (1843) of certain protozoan genera). <sup>9</sup> Ehrenberg (1832c : 114 (also 1832d : 114) described a species, Parametium [sic] kolpoda, and attributed it to himself without reference to Losana's species, although the latter's monograph is cited in Ehrenberg, 1832. In later works (1834 : 30 [also 1835 : 174], 1837 : 164), Ehrenberg referred to this species by the same name. In his most important monograph (1838 : 352) he emended the spelling to "Parametium Colpoda" and, curiously, gave "Paramaccium" [sic] kolpoda" in the synonymy, although he had not used the spelling "Parametium [sic] kolpoda" in the synonymy, although he had not used the spelling "Paramaccium" for the genus in any of the works actually cited in 1838, having abandoned it after his monograph of 1830 (also 1832a and 1832b). Study of Losana's and Ehrenberg's descriptions reveals that one cannol say that both autkors' "Param(a)ecium kolpoda" if is the modern "Colpidium colpoda", we fed it best to accept Losana's species and to regard it as having been fixed by Ehrenberg in the sense of the modern species, which culd then be cited, in extenso, Colpidium colpoda (Losana, 1829, enemed. Ehrenberg's Mestin Canado then be

- (c) Genera with established types considered identical or congeneric with T. pyriformis
  - (x) Ptyxidium Perty, 1852 (type Enchelis ovulum Müller, 1773);
  - (xi) Saprophilus Stokes, 1887 (non Streubel, 1839—Coleoptera) (type S. agitatus Stokes, 1887);
  - (xii) Leucophrydium Roux, 1899 (type L. putrinum Roux 1889);
  - (xiii) Lambornella Keilin, 1921 (type L. stegomyiae Keilin, 1921);
  - (xiv) Paraglaucoma Kahl, 1926 (type P. rostrata Kahl, 1926);
  - (xv) Protobalantidium Abé, 1927 (type Balantidium knowlesii Ghosh, 1925);
  - (xvi) Turchiniella Grassé and de Boissezon, 1929 (type T. culicis Grassé and de Boissezon, 1929);
  - (xvii) Leptoglena Grassé and de Boissezon, 1929 (type Balantidium knowlesii Ghosh, 1929);
  - (xviii) Paraglaucoma Warren, 1932 (type P. limacis Warren, 1932);
    - (xix) Tetrahymena Furgason, 1940 (type T. geleii Furgason, 1940 [subjective junior synonym of Leucaphryspyriformis Ehrenberg, 1830]);
    - (xx) Sathrophilus Corliss, 1960 (= 1960a) (type Saprophilus agitatus Stokes, 1887).

11. The foregoing three groups of genera are considered in the following three subsections, which are succeeded by a fourth dealing with the specific names *pyriformis* and *patula*, both of Ehrenberg (1830), and by a fifth and final subsection on *Tetrahymena* itself.

## A. Genera Without Established Types

12. Inspection of the list under paragraph 10 (a) reveals that, whereas there are five nominal genera, these can apply, under usual application of the Code to but four taxonomic genera, for *Leucophrys* was a deliberate emendation of *Leucophra*, and the type species of one, if validly selected, is *ipso facto* type of the other (Article 69, part a).

13. The fact that four such old genera as *Enchelis* Müller, 1773, *Trichoda* Müller, 1773, *Leucophra* Müller, 1780, and *Acomia* Dujardin, 1841, have no established type species is striking testimony to the still primitive state of ciliate nomenclature. It is obvious that, if types identical, or congeneric, with *T. pyriformis* could be selected for one or more of these genera, then the earliest generic name, so restricted, would be the correct title for the genus including *T. pyriformis*. But such could not be done with either *Trichoda or Leucophra*; these two genera, as originally constituted, did not include species that can be recognized as identical, or congeneric, with *T. pyriformis*. Therefore, it follows that, by usual application of the Code, *Leucophrys* likewise cannot enter the picture in this connection. (*Enchelis* and *Acomia* are treated separately in paragraphs 19–21.)

14. Even though *Trichoda* and *Leucophra* cannot affect the status of *Tetra-hymena*, we feel that the opportunity to make some disposition of these old generic names should not be neglected. Both constitute long-buried but still-living nomenclatural relics, which could conceivably be disinterred and re-animated, with probable subsequent necessity of their being done to death

once and for all. Study of their originally included species reveals that no useful purpose would be served by our attempting to preserve them through designating, as their types, such species as would then apply to taxonomic genera for which *Trichoda* and *Leucophra* would be the earliest available names.

15. Trichoda Müller, 1773, was originally established with 40<sup>6</sup> nominal species (Müller, 1773 : 71–96), none of them type by designation or indication; they were listed again in a later publication by Müller (1776 : 206–209). Without going into detail, we may state that, whereas none can be taken as identical, or congeneric, with *T. pyriformis*, several can be identified with reasonable certainty and have subsequently become types of other, later nominal genera.

16. Trichoda comes into consideration in connection with members of the Tetrahymena-group because; (1) Müller (1786: 108) added a new species. T. pirum, which Ehrenberg (1830:96 [see also 1832b:76]7) later tentatively identified as being in part identical with his "new" species Leucophrys pyriformis<sup>8</sup> (see also paragraphs 23 and 28); and in part transferred to the genus Kolpoda Müller, 1773; (2) Ehrenberg (1830; 96 Jalso 1832b; 76 and 1832d; 105]) described a species under the name Leucophrys patula<sup>9</sup> and earlier in the same work (1830:62 [also 1832b:42]), gave the synonymy "Leucophrys patula, Trich, pat, M." [= Trichoda patula Müller, 1786] and shortly thereafter (Ehrenberg, 1832c: 105 [also 1832d: 105]) "L. patula E. ! Trichoda patula Müller", thus eliminating any possible confusion with Trichoda patella Müller, 1773 (: 95) (see also paragraphs 17, 40-45); and (3) the nominal species Trichoda pura Ehrenberg, 1832 (= 1832c : 104 [also ] 1832d : 104]) and Trichoda carnium Ehrenberg, 1832 (= 1832c : 104[also 1832d : 104]) are, in our opinion, probable synonyms of the species originally described by Ehrenberg under the name Leucophrys pyriformis. The best solution to the problem posed by the existence of Müller's nominal genus would appear to us to be settling on an unrecognizable species as type and thus consignment of the genus to limbo as a *genus dubium*.

<sup>&</sup>lt;sup>6</sup> These species were misnumbered by Müller in two places (: 83, 85) so that, on casual checking, one may think there were only 38.

<sup>&</sup>lt;sup>7</sup> The works of Ehrenberg have generally been cited in a confused way. This situation has come about by reason of two facts, briefly described as follows. First, four of his monographic studies had double publication: (a) as three separate works (1830, 1832c, 1834); and (b) as parts of four separate issues of the *Physikalische Ablandhungen* in the series *Ablandhungen der Kömglichen Akadenia der Wissenschaften* zu Berlin (thus 1830, pp. 12-008). The series *Ablandhungen* is the series *Ablandhungen* is hould be observed that the first two and the last appeared as separate publications two and one years, respectively, ahead of the corresponding editions in the *Abhandhungen*, series responding editions in the *Abhandhungen*, are not coloured plates which, in the corresponding editions in the *Abhandhungen*, are not coloured; however, the third appeared which, as available to us, have coloured plates which, in the corresponding editions in the *Abhandhungen*, are not coloured; however, the third appeare-1832d—in the ..., *Abhandhungen*, ear on to coloured; however, the third appeare-1832d—in the volume (the latter being designated by year rather than in numerical sequence). Thus, 1832a = 1835; 1832b = 1836; 1832b = 1836; 1832b = 1833; and 1837 = 1835. Workers have commonly referred only to Ehrenberg's works a pleared and 1832; and 1837 = 1835. Workers have commonly referred only to Ehrenberg's works in the *Abhandhungen*, ignoring his separate publication. Responding designated by year rather than in numerical sequence). Thus, 1832a = 1830; 1832b = 1830; 1832b = 1833; and 1837 = 1835.

<sup>&</sup>lt;sup>8</sup> " Das birnförmige Wimperthierchen, Leucophrys pyriformis, eine Art, die wahrscheinlich auch unter Kolpoda pyrum Müller gehört hat."

<sup>9 &</sup>quot; Das weite Wimperthierchen, Leucophrys patula."

As type of Trichoda Müller, 1773, we therefore select Trichoda acarus Müller, 1773 (: 71) an originally included species, unidentifiable in our opinion.

17. Leucophra Müller, 178010,11 (: 4), was established without designated or indicated type for three new, nominal species-L. fluida, L. fluxa, and L. armilla. Leucophra comes into consideration in connection with the Tetrahymena-group because to it, in its emended form (Leucophrys of Ehrenberg, 1830).<sup>12</sup> Ehrenberg (1830 : 96) added the new species Leucophyrs pyriformis (T. pyriformis) and also ostensibly transferred from Trichoda to Leucophrys the nominal species T. patula Müller, 1786 (see paragraphs 16, 40-45). As with Trichoda, we believe that we may deal best with Leucophra by selecting an unrecognizable species as its type-namely L. armilla Müller, 1780 (: 4). (This name was most probably applied by Müller inadvertently to a piece of lamellibranch gill unrecognizable as to species.) Thus, Leucophra, too, is consigned to limbo.

18. Under the usual application of the Code,13 Leucophrys Ehrenberg, 1830, automatically follows Leucophra.

19. Enchelis and Acomia require separate treatment because, unlike Trichoda and Leucophra, each was originally proposed for a group of species including members that can conceivably be regarded as congeneric with Tetrahymena pyriformis. Thus, disposing of these nomenclatural relics has an importance here transcending that at issue with Trichoda and Leucophra, which pose no nomenclatural threat to Tetrahymena. With Enchelis and Acomia our aim must be to preclude any possibility of their being made applicable to the Tetrahymena-group.

20. Enchelis Müller, 1773, was originally established with 11 nominal species (Müller, 1773 : 34 ff), none of them type by designation or indication. No subsequent worker has selected a type, to the best of our knowledge. Berthold (in Latreille, 1827) emended the spelling of the generic name to Enchelys: this correction has been adopted universally. Most of Müller's species have long since been transferred from the genus. Indeed, as characterized in recent times (e.g., see Kahl, 1930 : 96 ff), it represents a distinct group of gymnostome holotrichs far removed from any direct affinities with the Tetra-

<sup>12</sup> Ehrenberg (1830 : 96 Jalso 1832b : 76]) wrote as follows: "Da der Name Leucophra unrichtig gebildet ist, und deshalb von einigen (Goldfuss) Leucophra geschrieben wird, was wegen die Absicht des Gründers scheint, so habe ich für gut gehalten, obige Endung anzuwenden '

13 Article 67, part i.

<sup>&</sup>lt;sup>10</sup> Ehrenberg (1838 : 311) erroneously attributed Leucophra to Müller as of 1776; however,

<sup>&</sup>lt;sup>10</sup> Ehrenberg (1838 : 311) erroneously attributed Leucophra to Müller as of 1776; however, 1776 represents the date of a preliminary monograph entitled Zoologiae Danicae Podromus..., whereas Leucophra actually appeared in fase, 2 (1780) of plates published under the title Zoologiae Danicae ... Icones. Moreover, Ehrenberg referred to "4 species", but Müller actually named only three species in his 1780 publication, adding the fourth in the text Zoologia Danica... (1784 : 124), corresponding to the 1780 volumes of plates. " The publication, adding the fourth in the text Zoologia Danica ... (1784 : 124), corresponding to the 1780 volumes of plates. " The publications of 0. F. Müller are almost as confusing as those of Ehrenberg. The part of the former worker's great historical monograph, Zoologica Danica ..., in which appeared the names of interest to us here, had two editions; for the first edition, the plates (1780 – under a separate title [see footnote 10]) with two pages of brief legends, appeared before the detailed text (1784), whereas, for the second edition, text and plates appeared simultancously (1788), so far as we can determine. In each instance in which an organism was figured and named in the first edition of the plates (1780), its name should date from that publication. publication.

hymena-group of hymenostomes. Its historic connection with the main problem under discussion in the present paper is through *E. ovulum* Müller, 1773, type of the genus *Physicilum* Perty, 1852 (see paragraph 29). To make certain that the genus *Enchelys* as recognized today is severed completely from such a connection, we hereby select, as its type, the species *Enchelis farcimen* Müller, 1773 (: 34), one of the few originally included species still currently retained in the genus.

21. Acomia Dujardin, 1841, was originally established with seven species (Dujardin, 1841 : 382-384), none of them type by designation or indication, and was dropped within forty years of its creation. That it should enter into a discussion of the *Tetrahymena*-group is principally due to Maupas (1883), who listed, as possibly identical with his *Glaucoma pyriformis* (*T. pyriformis*), two species of *Acomia (A. inflata Dujardin, 1841; A. ovata Dujardin, 1841)*, which, although very poorly characterized, are conceivable as congeners of *T. pyriformis*. To avoid any future trouble with this ill-defined and generally forgotten genus, we select, as type, the originally included, and unidentifiable, species *Acomia vitrea* Dujardin, 1841 (: 382), an organism that we consider definitely non-congeneric with the type of the genus *Tetrahymena*.

B. Genera with Established Types not Considered Congeneric with T. pyriformis

22. Of the four genera with established types not here considered congeneric with the type of *Tetrahymena*, two—*Calpoda* Müller, 1773, and *Balantidium* Claparede and Lachmann, 1858—are trichostome genera, thus not even in the same ordinal group as *Tetrahymena*; and, the other two—*Glaucoma* Ehrenberg, 1830, and *Colpidium* Stein, 1860—although closely related to *Tetrahymena* in the hymenostome family Tetrahymenidae, are separated from *T. pyriformis* at the generic level. Therefore, all four genera can be dealt with fairly easily here. They come into the present discussion because they have been treated by various investigators as generic vehicles for nominal species that we now recognize as identical, or congeneric, with *T. pyriformis*.

23. The genus Colpoda Müller, 1773, emend. Gmelin, 1790 [= Kolpoda Müller, 1773] has, as its type, Kolpoda cucullus Müller, 1773, as selected by Taylor and Furgason, 1938<sup>14</sup>—trichostome species, hence clearly not congeneric with pyriformis. Of concern to us here, nevertheless, is the ill-defined, small hymenostome species, Kolpoda pirum Müller, 1786, which, as already mentioned, was considered by Ehrenberg (1830) to be, in effect, a composite species. Thus, he applied the specific name, in the form "pyrum", to an organism listed by him (: 96) as "Trichoda pyrum?"; but he also treated (: 96) Müller's "Kolpoda pyrum" [sic] as possibly having included his own newly created species Leucophrys pyriformis (see paragraph 16, footnote 8). After studying the pertinent figures in the works of Müller and Ehrenberg, we realized that Kolpoda pirum, Trichoda pyrum and Leucophrys [(= Tetrahymena)] pyriformis cannot be inequivocally separated. (Indeed, various 19th century compilations list these

<sup>&</sup>lt;sup>14</sup> Taylor and Furgason (1938) erroneously attributed to Ehrenberg the selection of type for Colpoda. But they themselves are to be credited with this selection since they were the first to state that *cucullus* was the type of Kolpoda (Colpoda), so far as we have been able to determine.

names as synonyms of one another.) Our recommendations with respect to the specific name *pirum* Müller, 1786, are given in paragraph 38.

24. The genus Balantidium<sup>15</sup> Claparede and Lachmann, 1858, has as its type, Bursaria entozoon Ehrenberg, 1838, a species recognized today and clearly not congeneric with the type of Tetrahymena. Of concern to us here is the poorly described species Balantidium knowlesii Ghosh, 1925, for which two new nominal genera were subsequently created—Protobalantidium by Abé (1927) and Leptoglena by Grassé and de Boissezon (1929) (see paragraph 29)—and which is quite likely congeneric, possibly identical, with T. pyriformis. In recent years, another species of Tetrahymena (T. corlissi Thompson, 1955) was first recorded as belonging to the genus Balantidium<sup>16</sup> (e.g., by Speidel, 1951, 1953).

25. Glaucoma Ehrenberg, 1830, was, between the years 1883 and 1940, the the most popular generic vehicle for species now assignable to the genus Tetrahymena. This was a consequence of an important work by Maupas (1883), in which he (1) provided a description of pyriformis unequivocally identifiable by modern standards and. (2) transferred Ehrenberg's Leucophrys pyriformis to the genus Glaucoma, an unfortunate decision since, as Corliss (1953a: 67) pointed out, it has been " the cause of much of the subsequent confusion in the history of ciliates in the entire C-G-L-T group". The type species of Tetrahymena thus became well known as G, pyriformis, often written G, piriformis, especially by French physiologists (led by Lwoff). In view of the general state of ciliate taxonomy at the time of Maupas' work, it was, perhaps, not altogether unreasonable, although (in retrospect) most unfortunate, for him to place T. pyriformis in the same genus as the well established type of the genus Glaucoma, G. scintillans Ehrenberg, 1830. However, it is now recognized by modern workers that G, pyriformis cannot justifiably be considered congeneric with G. scintillans, as pointed out with precision by Furgason (1940). (G. scintillans has a number of valid congeners-see Corliss, 1954b.)

26. Colpidium Stein, 1860, has been applied as the generic name for several tetrahymenids—in particular, for a number of strains of *Tetrahymena pyriformis*. Such misuse—since *Colpidium* may be considered a valid genus in its own right—has stemmed principally from inadequate descriptions by Stokes (1885, 1886) of his species *Colpidium truncatum* Stokes, 1885, *C. striatum* Stokes, 1886, and *C. putrinum* Stokes, 1886. In our opinion (see also Corliss, 1953b), the first two of these species (also *Tillina campyla* Stokes, 1886) are valid members of the genus *Colpidium*, congeneric with the type *Paramaecium kolpoda* Losana, 1829, emended by Ehrenberg, 1838. They are not, therefore, congeneric with *T. pyrifornis*. By contrast, *C. putrinum*—as pointed out by Corliss (1953a)—may be identical with the species *T. pyrifornis*; but, since *pyrifornis* antedates *C. putrinum*, the latter does not affect the status of the former.

<sup>&</sup>lt;sup>15</sup> First recognized as belonging to the order Trichostomalida by Fauré-Fremiet (1955); erroneously considered, for many years, a member of the quite dissimilar spirotrichous order Heterotrichida. Fauré-Fremiet's allocation is today widely accepted. <sup>16</sup> Unfortunately this generic name has been invoked more than once by clinical parasitologists and medical men for any small ciliate found in symbiotic existence in vertebrate tissues-

<sup>&</sup>lt;sup>16</sup> Unfortunately this generic name has been invoked more than once by clinical parasitologists and medical men for any small ciliate found in symbiotic existence in vertebrate tissues presumably because *Balantidium coli* is the sole ciliate parasite of the human body. Actually, a number of species of *Tetrahymena* are now known to exist as facultative parasites in a wide variety of hosts (see Corliss, 1953a, 1954a, 1960b; Corliss, Smith, and Foulkes, 1962; Thompson, 1958).

### C. Genera with Previously Established Types Here Considered Congeneric, or Identical with T. pyriformis

27. In addition to *Tetrahymena*, there are ten nominal genera in this category, of which six have somewhat or very poorly described types, and four have relatively well known types. Species in the latter category are, in our opinion, congeneric, but not identical, with *T. pyriformis*.

28. The six genera that cannot be unequivocally characterized, at least at present, are: *Ptyxidium* Perty, 1852; Saprophilus Stokes, 1887; *Protobalantidium* Abé, 1927; *Turchiniella* Grassé and de Boissezon, 1929; *Leptoglena* Grassé and de Boissezon, 1929; and Sathrophilus Corliss, 1960.

29. We think that the problem posed by four of these nominal genera (*Ptyxidium*, *Protobalantidium*, *Turchiniella*, and *Leptoglena*) is best dealt with by their unconditional suppression by the International Commission, acting under plenary powers, for purposes of the Law of Priority but not of the Law of Homonymy. *Leptoglena*, as an objective junior synonym of *Protobalantidium* (*i.e.*, with the same type species—*Balantidium* knowlesii Ghosh, 1925), is invalid in any event. *Enchelis ovulum* Müller, 1773, type of *Ptyxidium*<sup>17</sup> is an obscure form, but probably a tetrahymenid. *Balantidium knowlesii* Ghosh, 1925, type of *Protobalantidium* (and *Leptoglena*), and *Turchiniella* culicis Grassé and de Boissezon, 1929, type of *Turchiniella*, are seemingly synonymous with either *T. psriformis* or *Tetrahymena chironomi* Corliss, 1960, or they represent separate tetrahymenid species (see Corliss, 1960b : 130, 131). If suppressed by the International Commission, these generic names should be placed on the appropriate Official Index and be eliminated as potential senior synonyms of *Tetrahymena*.

30. With Saprophilus Stokes, 1887, and Sathrophilus Corliss, 1960, the problem of senior synonymy does not arise. Saprophilus Stokes, 1887, as a junior of homonym of Saprophilus Streubel, 1839 (Coleoptera), cannot affect the status of Tetrahymena, nor is it available for its type, S. agitatus Stokes, 1887, which was described with certain features that allow us to regard it as an independent species' rediscovery and redescription, its generic placement probably must remain undecided, as Holz and Corliss (1956) have already suggested. Saprophilus Stokes, 1887, is hereby referred to the appropriate Official Index. The generic name Sathrophilus have cerently been proposed by Corliss (1960a) to replace Saprophilus of Stokes and takes the same species, Saprophilus agitatus, as type. Further work is needed to establish Sathrophilus as an independent (presumably tetrahymena) genus or, alternatively, to sink it as a subjective junior synonym of Tetrahymena.

31. The four genera with types now adequately known are: Leucophrydium Roux, 1899; Lambornella Keilin, 1921; Paraglaucoma Kahl, 1926; and Paraglaucoma Warren, 1932 (non Kahl, 1926). Of these, the fourth is a junior homonym of the third and should be referred to the appropriate Official Index. The three nominal genera thus left pose special difficulties. Since their types are

<sup>&</sup>lt;sup>17</sup> This poorly characterized genus enters our discussion here primarily because of Maupas' (1883) listing its only species as a synonym of his *Glaucoma pyriformis* [= T. pyriformis].

congeneric, but not identical, with *T. pyriformis*, their unconditional suppression by the International Commission in favour of *Tetralymena* would preclude their possible use in the event that future workers were to fragment the genus, as we now conceive it. In other words, if *T. pyriformis* and one or more of the type species of the three genera now under consideration were to be separated at the generic level, the latter would be deprived of now-existing potential generic vehicles. In our opinion, a reasonable alternative would be for the International Commission, under its plenary powers, to suppress the three nominal genera conditionally—that is, to direct that, so long as their type species are considered congeneric with *T. pyriformis*, these generic names be suppressed in favour of *Tetrahymena*, but that they remain potentially available if, through future work, separate genera are needed for their type species (and possible congeners).

32. Leucophrydium has, as type, the nominal species L. putrinum Roux, 1899, which is a junior subjective synonym of the species long known as Leucophrys patula Ehrenberg, 1830. Leucophrydium is the earliest generic name restricted to a clearly defined species of Tetrahymena, as we conceive the latter genus. But great confusion would surely attend any attempt to replace the widely known name Tetrahymena, with an obscure one, such as Leucophrydium, which has never enjoyed general usage. Yet, conditionally suppressed, it would be potentially available for Leucophrys patula if that species were ever generically separated from T. pyriformis.

33. Lambornella Keilin, 1921, was based on the single (type) species, L. stegonyiae Keilin, 1921, which, as originally described, was rather more defective as regards conventional diagnostic features than Leucophrydium putrinum. Recently one of us (Corliss, 1960b) has been able to study material that he regards as belonging to L. stegonyiae and has concluded that this species is separate from, but congeneric with, T. pyriformis. Lambornella, conditionally suppressed, could likewise be removed as a threat to Tetrahymena, but remain potentially available if a separate genus were needed for its type.

34. Paraglaucoma Kahl, 1926, has as type P. rostrata Kahl, 1926, which, though clearly non-conspecific with T. pyriformis, is just as clearly, in our estimation, congeneric therewith. Other modern workers on the taxonomy of hymenostome ciliates are in full agreement with this view (e.g., Holz and Thompson, 1955; Kazubski, 1958; Kozloff, 1957; Stout, 1954; Thompson, 1958). Practically no one<sup>18</sup> has identified any ciliate as fitting Kahl's (1926) description of P. rostrata between the time of its original description and its rediscovery by Corliss (1952c)—a span of 25 years; since that time it has been consistently referred to as Tetrahymena rostrata. Again, if conditionally suppressed, Paraglaucoma would be removed as a threat to Tetrahymena but would remain potentially available for a genus based on its type.

<sup>&</sup>lt;sup>18</sup> Mugard (1949) erroneously identified one of her strains of "Glaucoma piriformis" as belonging to the species "Paraglaucoma rostrata Kahl". This mistake was acknowledged by her several years ago in a personal communication to one of us (J.O.C.).

#### D. The Species Leucophrys pyriformis Ehrenberg, 1830, and L. patula Ehrenberg, 1830

35. The specific names *pyriformis* and *patula* are today almost universally applied to species of *Tetrahymena* and attributed to Ehrenberg (1830). But with both there are nomenclatural problems best resolved, we feel, by formal action of the International Commission.

36. The specific name *pyriformis* Ehrenberg, 1830, by which the nominal type species of *Tetrahymena*, *T. geleii*, is now generically known, would advantageously be protected against possible subjective synonyms, of which we have already discussed *ovulum* Müller, 1773 (as published in the combination *Enchelis ovulum*—see paragraphs 20 and 30) and *pirum* Müller, 1786 (as published in the combination *Kalpoda pirum*—see paragraphs 16 and 23).

37. The nominal species *Enchelis ovulum* Müller, 1773, for which Perty (1852) created the genus *Ptyxidium* and which was later treated by Maupas (1883) as a synonym of his *Glaucoma pyriformis* [= T. *pyriformis*] is, we feel, best suppressed by the International Commission, acting under plenary powers.

38. With respect to the species Kalpada pirum Müller, 1786, it is clear that, although Ehrenberg explicitly separated out Leucaphrys pyrifarmis from it, the specific name pyrifarmis Ehrenberg, 1830, is not an objective junior synonym of pirum Müller, 1786, which is not in use today as attributed to Müller. The earlier specific name nevertheless remains as a possible subjective senior synonym and thus constitutes an embarrassment to the later one. This problem is again best resolved, in our view, by the suppression, under the International Commission's plenary powers, of the specific name pirum Müller, 1786.

39. Finally, it would be desirable for the International Commission, once again acting under plenary powers, to direct that no specific name of the many other ill-defined species described prior to *Leucophrys pyriformis* Ehrenberg, 1830, be available for the modern species *T. pyriformis*.

40. The specific name *patula*, *sensu* Ehrenberg, 1830, is beset with a problem more clearly defined than the threat of subjective senior synonymy. Nomenclaturally, *patula* of Ehrenberg descends from the specific name *patula* Müller, 1786 (as published in the combination *Trichada patula*) which was applied to an organism that, though crudely described and illustrated in the original, can reasonably be taken to have been a spirotrichous ciliate. Ehrenberg (1830), in describing *Leucophrys patula*, considered that he was dealing with Müller's species—at least in part (see paragraph 16, footnote 9). In actual fact, he combined *two* separate species under this name, one a spirotrich (which conceivably could be the same as Müller's species) and the other a holotrich, which, from that time until recently, went by the name *Leucophrys patula*.

41. Certain subsequent workers (notably Stein, 1860b, 1867; Maupas, 1888), recognizing that Ehrenberg combined two species under the name *Leucophrys patula*, sought to solve the problem by restricting this name to the holotrichous form and segregating out the spirotrichous form in a separate genus *Climacostomum* Stein, 1859, in which the specific name *patul(um)* was retained. Although a not unreasonable solution to a complex and vexing

problem, this is inadmissable under the Code.<sup>19</sup> It is evident that under the usual application of the Code, the specific name *patula* is unavailable for the taxonomic species known today as *Tetrahymena*, or *Leucophrys*, *patula*.

42. But the facts just set forth must be reckoned in the context of general usage. A crucial point is that no one has recognized this difficulty in any previous publication. In establishing the genus Tetrahymena, Furgason (1940) regarded his new nominal species T. geleii as generically distinct from the organism generally called Leucophrys patula. Not recognizing the unavailability, under the Code, of Leucaphrys for the latter species, he accepted this nominal genus, with L. patula as type. (So far as we can determine, this was the first actual statement that L. patula should be considered as type of the genus Leucaphrys. However, many workers and compilers, before 1940-and, indeed, since that date—have listed only this species in the genus *Leucophrys*. Thus it has conventionally appeared to be a unispecific genus.) In contrast to Furgason, Corliss (1951a) concluded that T, geleii [=T, pyriformis] and L. patula were congeneric and, recognizing the unavailability of Leucophrys for these two species, transferred L. patula to Tetrahymena. At that time, he had not yet discovered that several other generic names were earlier subjective synonyms of Tetrahymena.

43. If patula were rejected on nomenclatural grounds, the next (and only other) name available for the taxonomic species in question would be putrinum. Roux, 1899, as published in the combination Leucophrys platula. But even this name is not without question. The species Calpidium putrinum Stokes, 1886, is probably a member of Tetrahymena and possibly a synonym of T. pyrifornis (see paragraph 26). In any event, it can be seen that the name putrinum Roux, 1899, is potentially rejectable on the basis of secondary homonymy if Stokes' species is ever accepted as valid and, at the same time, as definitely belonging to the genus Tetrahymena.

44. From the foregoing discussion it is clear that *patula* can be used for the taxonomic species now generally known as *T. patula* only through action of the International Commission under its plenary powers. It is, we think, clearly in the interest of nomenclatural stability to preserve it in the sense of Ehrenberg (1830). But, if this specific name is maintained for the taxonomic species long known as *Leucophrys patula*, and recently as *T. patula*, it cannot be logically validated as from its use by Müller (1786). It may reasonably date, however, from its use by Ehrenberg (1830) with the stipulation that it is to be restricted to the holotrichous ciliate species included by him in his composite *Leucaphrys patula*. Under this name the taxonomic species in question was subsequently described with considerable precision by Maupas (1888) and in less detail by certain other authors.

45. We are still left with the problem of what to do with the specific name *patula* of Müller (1786). One cannot reasonably hold that this (spirotrichous) species is identifiable as from its original description by Müller. Moreover,

<sup>&</sup>lt;sup>19</sup> Article 49 clearly states, "The specific name used in an erroneous specific identification cannot be retained for the species to which the name was wrongly applied, even if the two species in question are in, or are later referred to, different genera".

even today, the nominal species to which the specific name has been, in effect, restricted—*Climacostomum patulum*—is not a definitely recognizable one. It is not the type of the genus *Climacostomum* Stein, 1860 (the status of which we do not feel qualified to pursue further in this communication). We therefore feel that the most satisfactory resolution of this unsettled condition would be for the International Commission, under its plenary powers, to suppress, for the purposes of the Law of Priority but not for those of the Law of Homonymy, the specific name Trichoda patula Müller, 1786, and to validate the specific name Leucophys patula Ehrenberg, 1830, for the species now generally known as T. patula.

#### E. The Genus Tetrahymena Furgason, 1940

46. To the best of our knowledge, all actions calculated to clear the way for the validation of the generic name Tetrahymena Furgason, 1940, have now been summarized. We strongly urge that this be done by the International Commission, under its plenary powers, and that Tetrahymena be placed on the Official List of Generic Names in Zoology. To realize the first of these ends, it would, perhaps, be sufficient for the International Commission simply to direct, without specific reference, that no earlier generic name shall be substituted for Tetrahymena. However, we think greater service is done through the specific enumeration, as has been done by us here, of the nomenclatural and taxonomic problems currently facing workers on the family Tetrahymenidae and through specific action by the International Commission on the basis of present knowledge in the several cases already surveyed.

47. At the same time as Tetrahymena is placed on the appropriate Official List, the invalid emendations Tetrahymen Mast and Pace, 1946, and Tetrahymenia Mugard, 1949,20 surely inadvertent in the second case, should be placed on the Official Index of Rejected and Invalid Generic Names in Zoology. is true, as Mast and Pace (1946) pointed out, that Tetrahymena (from τετρα, combining form for four; a skin, membrane) is orthographically defective; but this does not permit its correction under the Code.21

## III. Family-group Names Based on Genera Directly Involved with the Tetrahymena-group

48. Family-group names have been based on five of the genera here considered. These names are: Balantidiidae Reichenow in Doflein and Reichenow, 1929; Colpodidae Ehrenberg, 1838; Enchelyidae Ehrenberg, 1838; Leucophrvidae Mugard, 1949 (: 171-erroneously attributed by Mugard to Kahl-also given as " Leucophrydae " by Mugard, p. 181); and, most recently, Tetrahymenidae Corliss, 1952.

49. It should, in addition, be mentioned that a family Leucophryens was proposed by Dujardin, 1841, but this is best disregarded because (1) it was a vernacular name, and (2) it was never adopted by subsequent workers as dating from Dujardin's usage.

<sup>20</sup> Generally cited, incorrectly, as 1948. This doctoral thesis (Université de Paris) actually was published in the spring of 1949. <sup>21</sup> Article 32, c,

50. Under the rules adopted for family names at Copenhagen (International Commission on Zoological Nomenclature, 1953), Leucophryidae (emendation of Leucophrydae) could be used for the taxonomic family including the genus Tetrahymena.

51. However, in our opinion, it is undesirable to preserve the name Leucophryidae in place of Tetrahymenidae. The earlier family name has had almost no use. We therefore recommend that Leucophryidae Mugard, 1949, be suppressed in favour of Tetrahymenidae Corliss, 1952, and that the latter name be placed on the Official List of Family-Group Names in Zoology and the former name on the corresponding Official Index of Rejected and Invalid Family-Group Names in Zoology (along with Leucophryens Dujardin, 1841, and Leucophrydae Mugard, 1949).

## Recommendations<sup>22</sup> for the Solution of the Problems Raised Regarding the Generic Name Tetrahymena and the Specific Names Tetrahymena pyriformis and T. patula

52. Based on the data cited here, we, the authors, request the International Commission on Zoological Nomenclature:

- (1) to use its plenary powers:
  - (a) to suppress the following names for the purposes of the Law of Priority but not for those of the Law of Homonymy:
    - (i) Leptoglena Grassé & de Boissezon, 1929;
    - (ii) Protobalantidium Abé, 1927;
    - (iii) Ptyxidium Perty, 1852;
    - (iv) Turchiniella Grassé & de Boissezon, 1929;
    - (v) ovulum Müller, 1773, as published in the binomen Enchelis ovulum;
    - (vi) patula Müller, 1786, as published in the binomen Trichoda patula;
    - (vii) pirum Müller, 1786, as published in the binomen Kolpoda pirum;
    - (viii) *pyrum* Ehrenberg, 1830, as published in the binomen *Trichoda pyrum*;
    - (ix) Leucophryidae Mugard, 1949;
  - (b) to Rule that the generic name *Tetrahymena* Fergason, 1940, is to be given priority over the generic names *Lambornella* Keilin, 1921, *Leucophrydium* Roux, 1899, and *Paraglaucoma* Kahl, 1926, by any zoologist who considers the type-species of these genera to belong to the same genus-group taxon;
  - (c) to validate the emendation to Enchelys of the generic name Enchelis Müller, 1773;
  - (d) to validate the emendation to Colpoda of the generic name Kolpoda, Müller, 1773;

<sup>&</sup>lt;sup>22</sup> See also the appropriate columns in Tables I and II, tables which concisely summarize the nomenclatural data on the nominal genera and species involved—some 64 in all.

- (e) to validate the specific name *patula* Ehrenberg, 1830, as published in the binomen *Leucophrys patula*, in spite of the fact that Ehrenberg had no intention of publishing a new specific name;
- (f) to validate the emendation to colpoda of the specific name kolpoda (Paramaecium) Losana, 1829;
- (g) to Rule that the specific name Leucophrys pyriformis Ehrenberg, 1830, is to be given precedence over any earlier name published for the same species-group taxon;
- (2) to place the following generic names on the Official List of Generic Names in Zoology:
  - (a) Balantidium Claparède & Lachmann, 1858 (gender: neuter), type species, by monotypy, Bursaria entozoon Ehrenberg, 1838;
  - (b) Colpidium Stein, 1860 (gender: neuter), type-species, by monotypy, Paramecium colpoda Losana, 1829;
  - (c) Colpoda Müller, 1773 (gender: feminine), type-species, by designation by Taylor & Furgason, 1938, Kolpoda cucullus Müller, 1773;
  - (d) Enchelys Müller, 1773 (gender: feminine), type-species, by designation herein, Enchelis farcimen Müller, 1773;
  - (e) Glaucoma Ehrenberg, 1830 (gender: feminine), type-species, by monotypy, Glaucoma scintillans Ehrenberg, 1830;
  - (f) Tetrahymena Furgason, 1940 (gender: feminine), type-species, by original designation, Tetrahymena geleii Furgason, 1940;
- (3) to place the following specific names on the Official List of Specific Names in Zoology:
  - (a) entozoon Ehrenberg, 1838, as published in the binomen Bursaria entozoon (type-species of Balantidium Claparède & Lachmann, 1858);
  - (b) colpoda Losana, 1829, as published in the binomen Paramecium colpoda (type-species of Colpidium Stein, 1860);
  - (c) cucullus Müller, 1773, as published in the binomen Kolpoda cucullus (type-species of Colpoda Müller, 1773);
  - (d) farcimen Müller, 1773, as published in the binomen Enchelis farcimen (type-species of Enchelys Müller, 1773);
  - (e) scintillans Ehrenberg, 1830, as published in the binomen Glaucoma scintillans (type-species of Glaucoma Ehrenberg, 1830);
  - (f) pyriformis Ehrenberg, 1830, as published in the binomen Leucophrys pyriformis;
  - (g) paiula Ehrenberg, 1830, as published in the binomen Leucaphrys patula;
- (4) to place the family-group name TETRAHYMENIDAE Corliss, 1952 (typegenus *Tetrahymena* Furgason, 1940) on the Official List of Family-Group Names in Zoology;
- (5) to place the following generic names on the Official Index of Rejected and Invalid Generic Names in Zoology:

- (a) *Enchelis* Müller, 1773 (Ruled under the plenary powers in (1) (c) above to be an incorrect original spelling for *Enchelys*);
- (b) Kolpoda Müller, 1773 (Ruled under the plenary powers in (1) (d) above to be an incorrect original spelling for Colpoda);
- (c) Leptoglena Grassé & de Boissezon, 1929 (as suppressed under the plenary powers in (1) (a) above);
- (d) Leucopera Gmelin, 1790 (an incorrect spelling for Leucophra Müller, 1780);
- (e) Leucophrus Ehrenberg, 1838 (an incorrect spelling for Leucophra Müller, 1780);
- (f) Leucophrys Ehrenberg, 1830 (an unjustified emendation of Leucophra Müller, 1780);
- (g) Paraglaucoma Warren, 1932 (a junior homonym of Paraglaucoma Kahl, 1926);
- (h) *Protobalantidium* Abé, 1927 (as suppressed under the plenary powers in (1) (a) above);
- (i) Ptyxidium Perty, 1852 (as suppressed under the plenary powers in (1) (a) above);
- (j) Saprophilus Stokes, 1887 (a junior homonym of Saprophilus Streubel, 1839);
- (k) Tetrahymen Mast & Pace, 1946 (an unjustified emendation of Tetrahymena Furgason, 1940);
- (1) Tetrahymenia Mugard, 1949 (an incorrect spelling for Tetrahymena Furgason, 1940).;
- (m) Turchiniella Grassé & de Boissezon, 1929 (as suppressed under the plenary powers in (1) (a) above);
- (6) to place the following specific names on the Official Index of Rejected and Invalid Specific Names in Zoology;
  - (a) kolpoda Losana, 1829, as published in the binomen Paramaecium kolpoda (Ruled under the plenary powers in (1) (f) above to be an incorrect original spelling for colpoda);
  - (b) ovuhun Müller, 1773, as published in the binomen Enchelis ovulum (as suppressed under the plenary powers in (1) (a) above);
  - (c) patula Müller, 1786, as published in the binomen Trichoda patula (as suppressed under the plenary powers in (1) (a) above);
  - (d) piriformis of the literature (an incorrect spelling of "pyriformis") which has caused considerable, though unnecessary, confusion);
  - (e) pirum Müller, 1786, as published in the binomen Kolpoda pirum (as suppressed under the plenary powers in (1) (a) above);
  - (f) pyrum Ehrenberg, 1830, as published in the binomen Trichoda pyrum (as suppressed under the plenary powers in (1) (a) above);
- (7) to place the following family-group names on the Official Index of Rejected and Invalid Family-Group Names in Zoology:
  - (a) LEUCOPHRYIDAE Mugard, 1949 (type-genus Leucophrys Ehrenberg, 1830) (as suppressed under the plenary powers in (1) (a) above);
  - (b) LEUCOPHRYENS Dujardin, 1841 (type-genus Leucophrys Ehrenberg, 1830) (a vernacular name);

## (c) LEUCOPHRYDAE Mugard, 1949 (type-genus Leucophrys Ehrenberg, 1830) (an incorrect original spelling for LEUCOPHRYIDAE).

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r Disposition	Action Needed by International Commission	None ()	Addition to "Official List of Generic Names "	, Addition to " Official - List of Generic Names,	Addition to " Official List of Generic Names"	Suppression, under plenary powers, of this spelling for purposes or Priority, but not Homonymy, Addition to "Official Index of Rejected and Invalid Generic Names	
ole Status o 2	As Recognized or Recommended Here	Restricted to A. vitrea (not a tetrahymenid	A trichostome genus	A tetrahymenid genus separate from <i>Tetra</i> <i>hymena</i> (see next column)	A trichostome genus	(see next column)	
Status as Possib Subjective Synon of Tetrahymena	Mone Possible Probable Definite	+	+	+	+		
nt of Type	How determined	By selection (present paper	By indication (monotypy)	By indication (monotypy)	By selection (Taylor and Furgason, 193 [: 321])		
Establishme	Species	A. vitrea Dujardin, 1841 (: 382)	Bursaria entozoon Ehrenberg, 1838 (: 327)	Paramecium colpoda Losana, 1829 (: 45) (emend. pro Paramaecium kolpoda	Kolpoda cucullus Müller 1773 (: 58)		
		. Acomia Dujardin, 1841 (: 382)	. Balantidium Claparède and Lachmann, 1858 (: 247)	. Colpidium Stein, 1860 (=Stein, 1860a [:47])	. Colpoda Müller, 1773 emcnd. Gmelin 1790 (: 3894) (pro Kolpoda Müller, 1773 [: 56])	. Enchelis Müller, 1773 (: 34) (vide Enchelys)	
	Establishment of Type Status as Possible Subjective Synonym Status or Disposition of Tetrohymena	Establishment of Type     Status as Possible Subjective Synonym     Status or Disposition       Species     How determined     E     E     As Recognized or E     Artion Needed by	Establishment of Type     Status ar Possible of Tetrahymena     Status or Disposition       Subjective Synonym     Status or Disposition       Species     How determined     E       2     2     2       2     2     2       2     2     2       2     2     2       2     2     2       2     2     2       3     Recommended Here     International Commission       1841 (: 382)     1841 (: 382)     +     Restricted to At vitree	Establishment of Type     Status as Possible     Status as Possible       Status as Possible     Status or Disposition       of Tetrahyments       Species     How determined $\frac{2}{2}$ <th>Establishment of Type     Status as Possible       Status as Possible       Species     How determined     Species     Species     Action Needed by       I determined     Species     How determined     Species     Action Needed by       I determined     Species     How determined     Species     Action Needed by       I determined     Species     How determined     Species     Action Needed by       I determined     Species     Species     Action Needed by       I determined     Species     Species     Action Needed by       I determined     By selection     How determined     Action Needed by       I determine Distribution     Action Needed by       I determined     Species     Action Needed by       I determined     Species     Action Needed by       I determined     Species       By indication     How determined       I determined     Species       I determined     Species       Below       I determined       I determined       I determined       I determined       <td cols<="" th=""><th>Establishment of Type     Status as Possible of Etrabytness       Status as Possible of Etrabytness       Species       How determined     Z     S<!--</th--></th></td></th>	Establishment of Type     Status as Possible       Status as Possible       Species     How determined     Species     Species     Action Needed by       I determined     Species     How determined     Species     Action Needed by       I determined     Species     How determined     Species     Action Needed by       I determined     Species     How determined     Species     Action Needed by       I determined     Species     Species     Action Needed by       I determined     Species     Species     Action Needed by       I determined     By selection     How determined     Action Needed by       I determine Distribution     Action Needed by       I determined     Species     Action Needed by       I determined     Species     Action Needed by       I determined     Species       By indication     How determined       I determined     Species       I determined     Species       Below       I determined       I determined       I determined       I determined <td cols<="" th=""><th>Establishment of Type     Status as Possible of Etrabytness       Status as Possible of Etrabytness       Species       How determined     Z     S<!--</th--></th></td>	<th>Establishment of Type     Status as Possible of Etrabytness       Status as Possible of Etrabytness       Species       How determined     Z     S<!--</th--></th>	Establishment of Type     Status as Possible of Etrabytness       Status as Possible of Etrabytness       Species       How determined     Z     S </th

TABLE 1. Nominal Genera Having Direct Bearing on Nomenclatural Status of Tetrahymena

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iena	or Disposition	Action Needed by International Commission	s Addition to " Official re List of Generic Names "	us, Addition to "Official ra- List of Generic Names"	Suppression, under plenary powers, of this spelling for pur- poses of Priority, bur- poses of Priority, ad- dition to "Official Index"	us, Conditional suppression under plenary powers as replacement for <i>Tetrahymena;</i> avail- able for separate taxo- nomic genus, if needed
ral Status of <i>Tetrahyn</i>	m Status	As Recognized or Recommended Here	A gymnostome genu —as restricted her	A tetrahymenid gen separate from <i>Tet</i> <i>hymena</i> (see next column)	(See next column)	A tetrahymenid gen synonymous with <i>Tetrahymena</i> (see next column)
aring on Nomenclatu	Status as Possible Subjective Synonyn of Tetrahymena	Mone Possible Or Probable Probable	+	+		+
a Having Direct Bea	nt of Type	How determined	By selection (present paper)	By indication (monotypy)		By indication (monotypy)
BLE I. Nominal Gener	Establishme	Species	Enchelis farcimen Müller, 1773 (: 34) is	G. scintillans Ehrenberg 1830 (; 98)		L. stegomyiae Keilin 1921 (: 217)
TA			<ol> <li>Enchelys Müller, 1773, emend. Berthold in Latreille (pro. Enchel Müller, 1773 [: 34]</li> </ol>	7. Glaucoma Ehrenberg 1830 (: 98)	8. Kolpada Müller, 1773 (: 56) (vide Calpada)	9. <i>Lanbornella</i> Keilin, 1921 (: 217)

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Suppression, under plenary powers, for purposes of Priority, but not Homonymy; addition to "Official Index "	Addition to "Official Index"	As above	None	Addition to " Official Index of Rejected and Invalid Generic Names"	Conditional suppression under plenary powers as replacoment name for <i>Tetrahymena</i> — available for separate taxonomic genus, if needed	Addition to " Official Index of Rejected and Invalid Generic Names
An ill-defincd nominal tetrahymenid genus (see next column)	(See next column)	(Sce next column)	Restricted to <i>L. armilla</i> (not a tetrahymenid- probably a piece of lamellibranch gill!) hence a genus dubium	(See next column)	<ul> <li>A tetrathymenid genus, synonymous with <i>Tetrathymena</i> (see next column)</li> </ul>	(See next column)
+			+		Ŧ	
By indication (monotypy)			By selection (present paper)		By indication (monotypy)	
Balantidium knowlesii Ghosh 1925 (: 187)			<i>armila</i> Müller 1780 (: 4)		L. putrinum Roux 1899 (: 589)	
<ul> <li>10. Leptoglena Grassé and de Boisscon 1929 (: 187)</li> </ul>	<ol> <li>Leucopera Gmelin, 1790</li> <li>(: 3028) (err. pro Leucophra q.v.)</li> </ol>	12. Leucophora Goldfuss 1820 (: 67) (err. pro Leucophra, q.v.)	13. Leucophra Müller, 1780 (: 4)	14. Leucopirus Ehrenberg 1838 (: 311) (err. pro Leucopira, q.v.)	15. Leucophrydium Roux 1899 (: 589)	<ol> <li>Leucopirys Ehrenberg, 1830 (: 96) (emend. pro Leucopira, q.v.)</li> </ol>

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	Establishmer	it of Type	Status as Possib Subjective Synon of Tetrahymenc	te Status or	Disposition
	Species	How determined	None Probable Probable Definite	As Recognized or Recommended Here	Action Needed by International Commission
<i>laucoma</i> Kahl, 6 (: [199], 351)	P. rostrata Kahl, 1926 (: 351)	By indication (monotypy)	Ť	<ul> <li>A tetrahymenid genus synonymous with Tetrahymena (see next column)</li> </ul>	Conditional suppression, under plenary powers, as replacement name for <i>Terdymena</i> — available for separate taxonomic genus, if needed
<i>laucoma</i> Warren, 2 (: 11) ( <i>non</i> hl, 1926)	P. limacis Warren, 1932 (: 11)	By indication (monotypy)	+	Junior homonym of Paroglaucoma Kahl, 1926 (see next column)	Addition to "Official Index of Rejected and Invalid Generic Names"
balantidium Abé, 11 (; 9)	Balantidium knowlesii Ghosh, 1925 (: 189)	By indication (monotypy)	+	An ill-defined, nominal tetrahymenid genus (see next column)	Suppression, under plenary powers, for purposes of Priority, but not Homonymy: addition to "Official Index "
<i>dium</i> Perty, 22 (: 148)	Enchelis ovulum Müller, 1773 (: 36)	By indication (monotypy)	+	An ill-defined, nominal tetrahymenid genus (see next column)	Suppression, under plenary powers, for purposes of Priority, but not Homonymy; addition to "Official

TABLE I. Nominal Genera Having Direct Bearing on Nomenclatural Status of Tetrahymena

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Addition to "Official I, Index"	l None	Addition to "Official Index"	Validation, under plen- ary powers, against all subjective senior synonyms: addition to "Official List of Generic Names"	Addition to " Official Index "	None	Suppression, under plenary powers for purposes of Priority, but not Homonymy, addition to "Official Index."
Junior homonym of Sapraphilus Streubel 1839 (Coleoptera)	An ilt-defined, nominal tetrahymenid genus, possibly a junior synonym of Tetrahymena	(Sce next column)	<ul> <li>Type genus of family Tet agnus of family Tet anymendae Coritss, 1952 (=1925d : 4)—sub- jective junior synonym of several nominal general (see next column)</li> </ul>	(Sce next column)	Restricted to T. acarus (an unrecognizable species—bence a genus dubium)	An ill-defined nominal tetrahymenid genus, (see next column)
+	+		'			+
					+	
By indication (monotypy)	By designation (Corliss, 1960 [=1960a : 276]		By designation		By selection (present paper)	By indication (monotypy)
S. agilatus Stokes, 1887 (: 247)	Saprophilus agitatus Stokes, 1887 (: 247)		r, geleit Furgason 1940 (; 258)		: <i>acaru</i> s Müller, 1773 (: 71)	: culicis Grassé and de Boissezon 1929 (; 187)
21. Saprophilus Stokes, 1887 (: 247) (non Streubel, 1839 [: col] 136)	22. Sathrophilus Corliss, 1960 (=1960a : 276)	23. Tetrahymen Mast and Pace, 1946 (: 232) (emend, pro Tetrahymena q.v.)	24. <i>Teirahymena</i> Furgason 1940 (; 258)	<ol> <li>Tetrahymenia Mugard, 1949 (: 182) (err. pro Tetrahymena, q.v.)</li> </ol>	6. Trichoda Müller, 7 1773 (: 71)	<ol> <li>Turchiniella Grassé and de Boissezon, 1929 (: 187)</li> </ol>
21.	22.	23.	24.	25.	26. 1	27. 7

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	Original Combination	Recognize Today*	d Modern Name Ac	tion Needed, With Respect Original Name, by crnational Commission
l. acarus Müller, 1773 (: 71)	Trichoda acarus	I		None
2. agitatus Stokes, 1887 (: 247)	Saprophilus agitatus	ć	Sathrophilus agitatus (Stokes, 1887) Corliss, 1960 (=1960a : 8)	None
3. armilla Müller, 1780	Leucophra armilla	1		None
4. campyla Stokes 1886 (: 101)	Tillina campyla	+	Colpidium campylum (Stokes, 1886) Bresslau, 1922 (: 22)	None
5. carnium Ehrenberg, 1832 (: 104)	Trichoda carnium	2s	? Tetrohymena pyriformis (Ehrenberg, 1830 [: 96]) Lwoff, 1947 (: 103)	None
5. <i>chironomi</i> Corliss, 1960 (=1960b : 115)	Tetrahymena chironomi	+	Tetrahymena chironomi Corliss, 1960	None
7. colpoda Losana, 1829, cmend, Ehrenberg, 1838 (: 114) [=kolpoda Losana, 1829 (: 45)]	Paramaecium kolpoda	+	Colpidium colpoda (Losana, 1829, Ad emend. Ehrenberg, 1838) Stein, 1860 (=1860a : 47)	ddition to " Official List of Specific Names"
8. <i>corlissi</i> Thompson, 1955 (: 12)	Tetrahymena corlissi	+	Tetrahymena corlissi Thompson, 1955 (:12)	None
9. culicis Grassé and de Boisse zo 1929 (: 187)	a, Turchiniella culicis	?s	?Tetrahymena chironomi, T. pyriformis	None

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Addition to " Official List of Specific Names"	Addition to " Official List of Specific Names"	Addition to "Official List of Specific Names"	None	None	None	None	None	Addition, in this spelling, to "Official Index of Invalid and Rejected Specific Names"	None	None	Suppression, under Plenary Powers, for purposes of Priority but not Homonymy; addition to "Official Index""
Colpoda cucultus Müller, 1773	Balantidium entazoon (Ehrenberg, 1838)	Enchelys farcimen			T. pyriformis	?T. pyriformis	?T. pyriformis		<i>Tetrahymena limacis</i> (Warren, 1932) Kozloff, 1946 (: 449)	? T. pyriformis	? T. pyriformis
+	+	+	I	I	s	?s	s;		+	3s	6.
Kolpoda cucultus	Bursaria entozoan	Enchelis farcimen	Leucophra fluida	Leucophra fluxa	Tetrahymena geleii	Acomia inflata	Balantidium knowlesii	Paramaecium kolpoda	Paraglaucoma limacis	Acomia ovata	Enchelis ovulum
10. cucultus Müller, 1773 (: 58)	11. entozoon Ehrenberg, 1838 (: 327)	12. <i>farcimen</i> Müller, 1773 (: 34)	13. fluida Müller, 1780 (: 4)	14. fluxa Müller, 1780 (: 4)	15. <i>geleii</i> Furgason, 1940 (: 258)	16. inflata Dujardin, 1841 (: 383)	17. knowlesii Ghosh, 1925 (: 189)	18. <i>kolpoda</i> Losana, 1829 (: 45) (vide <i>colpoda</i> )	19. <i>limacis</i> Warren, 1932 (: 11)	20. ovata Dujardin, 1841 (: 383)	21. ovulum Müller, 1773 (: 36)

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	II. SPORTO INAMICS WITH DUC	n meaning u	a romenciatural status of species o	1 erranymena
	Original Combination	Recognized Today*	I Modern Name	Action Needed, With Respect to Original Name, by International Commission
22. patella Müller, 1773 (: 95	5) Trichoda patella	1		None
23. <i>patula</i> Müller, 1786 (: 18	1) Trichoda patula	¢.	? Climacostomum patulum (Müller, 1786) Stein, 1860 (=1860b : 60)	Suppression, under Plenary Powers for purposes of Priority but not Homonymy; addition to "Official Index"
24. patula Ehrenberg, 1830 (:	: 95) Leucophrys patula	+	Tetrahymeno patula (Ehrenberg, 1830) Corliss, 1951 (=1951b : 11)	Validation, under Plenary Powers; addition to the " Official List of Specific Names"
25. piriformis of the literatur	e Glaucoma piriformis	s	T. pyrifarmis	Addition to " Official Index"
26. <i>pirum</i> Müller, 1786 (: 108	8) Kolpoda pirum	¢.	? T. pyriformis	Suppression, under Plenary Powers, for purposes of Priority but not Homonymy; addition to "Official Index"
27. pura Ehrenberg, 1832 (: 1	104) Trichoda pura	25	T. pyriformis	None
28. putrinum Stokes, 1886 (:	103) Colpidium putrinum	5;	? T. pyriformis	None
29. putrinum Roux, 1899 (: 5	89) Leucaphrydium putrinum	s	T. patula	None
30. pyriformis Ehrenberg, 18:	30 Leucophrys pyriformis	+	Tetrahymena pyriformis (Ehrenberg, 1830) Lwoff, 1947	Validation, under Plenary Powers; addition to " Official List"

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Suppression, under Plenary Powers, for purposes of Priority but not Homonymy; addition to "Official Index"	None	Addition to " Official List of Specific Names"	None	None	None	None	nior synonym;
? T. pyriformis	<i>Tetrahymena rostrata</i> (Kahl, 1926) Corliss, 1952 (=1952c : 3)	Glaucoma scintillans Ehrenberg, 1830	Tetralıymena stegonyiae (Keilin, 1921) Corliss, 1960 (=1960b :125)	Colpidium striatum Stokes, 1886	Colpidium truncatum Stokes, 1885		species of uncertain status; $s = ju$
e.	+	+	+	+	+	I	6 = ;
Trichoda pyrum	Paraglaucoma rostrata	Glaucoma scintillans	Lambornella stegomyiae	Colpidium striatum	Colpidium truncatum	Acomia vitrea	<ul> <li>- unidentifiable species;</li> </ul>
1. pyrum Ehrenberg, 1830 (: 96)	2. rostrata Kahl, 1926 (: 351)	3. scintillans Ehrenberg, 1830 (: 98)	4. stegomytae Keilin, 1921 (: 217)	5. striatum Stokes, 1886 (: 103)	6. truncatum Stokes, 1885 (: 442)	7. vitrea Dujardin, 1841 (: 382)	*+ = recognized species;